Comparison of Preincisional and Postincisional 0.25% Levobupivacaine Infiltration in Thyroid Surgery

Tiroid Cerrahisinde Preinsizyonel ve Postinsizyonel %0,25 Levobupivakain İnfiltrasyonunun Karşılaştırması

Infiltration Anesthesia in Thyroid Surgery

Mürsel Ekinci[1], Birzat Emre Gölboyu[1], Ayşe Nur Yeksan[2], Onur Dülgeroğlu[3], Murat Aksun[4], Pınar Karaca Baysal[1]
[1]Clinic of Anesthesiology and Reanimation, Kars State Hospital, Kars,
[2]Department of Anesthesiology and Reanimation, Kafkas University Medical Faculty, Kars,
[3]Clinic of General Surgery, Kars State Hospital, Kars,
[4]Clinic of Anesthesiology and Reanimation, Katip Çelebi Education and Research Hospital, Izmir, Turkey

Özet

Amaç: Boyun cerrahisinde analjezi amaçlı yara yerinin lokal anestezik ile infiltrasyonu konusuna literatürde yeterince yer verilmemiştir. Gereç ve Yöntem: Tiroid cerrahisi planlanan 60 hasta rastgele iki gruba ayrıldı. Grup 1'de insizyon öncesi Grup 2'de cerrahi bitiminde yara yerine %0.25'lik levobupivakain uygulandı. Hastalar postoperatif dönemde ağrı ve yan etkiler açısından 24 saat takip edildi. İntraoperatif ve postoperatif opioid tüketimi, ilk analjezik gereksinim zamanı kaydedildi. 24 saat sonunda hasta memnuniyeti değerlendirildi. Bulgular: İnsizyon öncesi lokal anestezik uygulanan grupta daha düşük ağrı skorları ve analjezik tüketimi, daha geç analjezik ihtiyacı ve daha iyi hasta memnuniyet sağlandı. Tartışma: Lokal anestezik infiltrasyonu tiroid cerrahisi sonrası ağrı tedavisi için güvenilir ve pratik bir yöntemdir. İnsizyon öncesi lokal anestezik ile yara yeri infiltrasyonu daha iyi sonuçlar vermektedir.

Anahtar Kelimeler

Anestezi; İnfiltrasyon; Levobupivakain; Tiroidektomi

Abstract

Aim: The use of local anesthetics for pain management following neck surgery is not a well-studied field. Material and Method: Sixty patients scheduled for thyroid surgery were randomly allocated into two groups. Wound infiltration with 0.25% levobupivacaine was performed before the incision in Group 1 and at the end of surgery in Group 2. Pain scores and side effects were followed for 24 hours. Intraoperative and postoperative analgesic consumption and first analgesic requirement time were recorded for each patient. Patient satisfaction was also evaluated at the end of 24 hours. Results: Lower pain scores, less analgesic consumption, later analgesic requirement and better patient satisfaction were obtained in the preincisional infiltration group. Discussion: Local anesthetic infiltration is a safe, practical method of pain management following thyroid surgery. Preincisional wound infiltration gives better results.

Keywords

Anesthesia; Infiltration; Levobupivacaine; Thyroidectomy

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Corresponding Author: Mürsel Ekinci, Clinic of Anesthesiology and Reanimation, Kars State Hospital, 36100, Merkez, Kars, Turkey.
GSM: +905067137596 E-Mail: murselek@mynet.com

Introduction

Neuronal plasticity, central sensitization, and increased COX-2 form the basis for postoperative pain. Therefore, multimodal analgesia has been recently adopted. This method suggests the combination of two or more agents or techniques so that side effects are minimized, while still benefitting from the analgesic effect of each agent or technique [1].

Patients who undergo planned thyroid surgery complain of moderate or severe postoperative pain [2]. Opioids are usually preferred in the treatment of pain after thyroid surgery; however side effects like respiratory depression, sedation, constipation, urinary retention, and pruritus restrict the use of these drugs [3]. Concerns about side effects result in the use of inadequate opioid doses, causing patient dissatisfaction due to the failure to relieve pain [4]. Adding nonsteroidal anti-inflammatory drugs (NSAIDs) to opioid drugs for multimodal analgesia is an option in this situation, but in some cases from the literature, they increased the risk of postoperative bleeding [5]. Superficial cervical plexus block is another option for pain management after thyroid surgery [5]. However, it has some disadvantages including being an invasive and difficult method [6].

Local anesthetics have long been used in postoperative pain treatment and for reducing opioid dose requirements. Many studies report success in pain relief after abdominal and inguinal surgeries in which local anesthetic was infiltrated at the incision site [6,7,8]. However, the use of local anesthetics for this purpose in neck surgery has not been well studied [3]. Although various local anesthetics are used at incisional sites for postoperative pain treatment, long-acting local anesthetics are more frequently preferred for this purpose [9,10].

In the present study, we aimed to compare analgesic effect and patient satisfaction in the postoperative period of thyroid surgery of patients for whom wound infiltration with levobupivacaine was performed before the incision with those who had levobupivacaine wound infiltration at the end of surgery.

Material and Method

This prospective randomized trial was performed after obtaining approval from the local ethics committee. Sixty ASA I-II patients scheduled for thyroid surgery were included in the study. The patients with a history of long-term analgesic drug use or use during the prior 24 hours, severe cardiac, respiratory, or neurologic disease, renal, or liver dysfunction, anticoagulant drug use, or hematologic disorder and those who chose not to participate were excluded from the study. For pain assessment, a 10 cm Visual Analogue Scale (VAS), in which no pain was represented with 0 and unbearable pain was represented with 10, was introduced to all participants. After obtaining informed consent from all patients, patients were randomly allocated into two groups (Group 1 and 2) by the closed envelope method. All patients were premedicated with intravenous 0.03 mg.kg-1 midazolam (Demizolam 5mg amp, Dem Drug Company, Istanbul, TURKEY) after ensuring a venous access with a 20 G IV cannula in the preparation room. Electrocardiography (ECG), noninvasive blood pressure, and peripheral oxygen saturation (SpO2) were employed for standard hemodynamics monitoring of all patients in the operating room (Avance GE Healthcare, Madison, USA). The anesthesia induction was executed with intravenous 2-2.5 mg.kg-1 propofol (Propofol amp %1, Propofol Fresenius Kabi, Hamburg, Germany), 0.6mg.kg-1 rocuronium (Esmeron amp 10 mg.mL-1 Merck Sharp & Dohme, Whitehouse Station, USA), and 2 µg.kg-1 fentanyl (Fentanyl amp 0.5 mg.10 mL-1, Abbott, Illinois, USA). Endotracheal tubes with an inner diameter of 7.5 and 8 mm were used via the orotracheal way for females and males, respectively, and end-tidal-carbondioxide (EtCO2) was monitored for all patients after intubation. Maintenance of anesthesia was ensured with inhaled 1 MAC desflurane (Suprane volatile solution, Eczacıbası, Baxter, PueltoRico, USA). Mechanical ventilation in volume controlled mode was started with the parameters of FiO2: 40%, tidal volume: 6-8 mL.kg-1, respiratory frequency: 12/min, I/E: 1/2, and PEEP: 6 cmH2O (Avance GE Healthcare, Madison, USA). The ventilation parameters were then adjusted according to EtCO2 levels targeting 35-38 mmHg partial carbondioxide pressure in expired air. Additional intravenous 0.5 µg.kg-1 fentanyl was given when heart rate or mean blood pressure increased by 20% compared to initial values and 0.1 mg.kg-1 rocuronium was administered every 30 minutes. Intraoperative fentanyl consumption was noted for each patient. Wound infiltration with 10 ml 0.25% levobupivacaine was performed before the incision in Group 1 (preincisional group) and at the end of surgery in Group 2 (postincisional group). All patients received 1 gr IV paracetamol 15 minutes before the end of surgery. Inhalational anesthetic was stopped after closure of the incision and decurarization was performed with intravenous 0.015 mg.kg-1 atropine and 0.03 mg.kg-1 neostigmine when first muscle effort was noticed after cessation of the gas. All patients were extubated after ensuring enough muscle strength and the ability to follow all commands. Total anesthesia time (starting from induction to extubation) and surgical time (the time starting from incision to closure of the skin) were also noted for each patient.

All patients were followed for 24 hours with regard to pain and side effects. The VAS score was recorded at the 15th minute and at the 1st, 4th, 8th, 12th, and 24th hours. Tramadol (0.5 mg .kg-1) was administered if the VAS score was ≥4. The minute of the first analgesic requirement was recorded and 24-hour analgesic consumption was recorded for each patient during the 0-4, 4-12, and 12-24 hour time intervals. Side effects of nausea, vomiting, dizziness, headache, sleepiness, mouth dryness, sweating, respiratory depression, itching, rash and hypotension were all recorded with level of severity as mild, moderate, or severe. Patient satisfaction was also evaluated with a 10-point scale at the end of the 24 hours.

Statistical Analysis

Statistical analysis of the data obtained in the study was made using SPSS for Windows 15.0 (SPSS Inc, Chicago, IL, USA) software. Conformity of the data to normal distribution was examined with the Kolmogorov-Smirnov test. Intergroup comparisons of the data obtained from the measure¬ments were made using the Student's t-test and Mann Whitney U-test. In the comparison of numerical data, the Chi-square test and the Fisher Exact test were used. Data were stated as mean±standard deviation (SD), number (n), percentage (%), and median (minimum-maximum). A value of $p<0.05$ was accepted as statistically significant.

Results

This study was performed in the operating rooms of Kars State Hospital in Turkey between 01.07.2015-01.04.2016. Ninety-eight elective thyroid surgeries were performed during this period. 24 of those were not included in the study due to exclusion criteria and 14 patients chose not to participate. Consequently, data from a total of 60 patients was collected in the present study.

There was no statitically significant difference between groups (p>0.05) considering gender distribution, age, weight, anesthesia and surgery times, and anesthesia risk classification (Table 1).

Table 1. Demographical data of the subjects; expressed as mean±SD, n (%)

	Group 1 Preincisional n:30	Group 2 Intraincisional n:30	P value
[a]Male/female	4/26	5/25	0,789
Age (years)	55,1 ± 12,1	54,3±11,8	0,324
Weight (kg)	70,6± 8,7	72,7±10,6	0,201
[a]ASA I/II (n)	21/9	23/7	0,658
Operation time (min)	136,7±9,1	139,1±10,7	0,198

Student's-t Test, [a]Chi-square test

The VAS scores at the 15th minute and at hour 1 and hour 4 were significantly lower in the preincisional levobupivacaine infiltration group (p=0.036, p=0.019, p=0.038, respectively). On the other hand, there was no statistically significant difference between the groups considering VAS scores at hours 8, 12, or 24 (Table 2). Even though the VAS scores of the postincisional levobupivacaine infiltration group were significantly higher than the preincisional infiltration group in the first 4 hours, the analgesia level in this period was also sufficient (mean VAS score <4) in the postincisional group, as it was in the preincisional group (Table 2).

Table 2. Comparison of VAS scores; expressed as mean±SD

	Group 1 Preincisional n:30	Group 2 Intraincisional n:30	P value
15 th min	1,8±0,3	3,1±0,8	0,036*
1st hour	2,1±0,9	3,3±0,9	0,019*
4th hour	2,1±0,7	2,5±0,9	0,038*
8th hour	2,2±0,7	2,4±0,7	0,329
12th hour	1,8±0,5	1,9±0,8	0,257
24th hour	1,1±0,3	1,4±0,7	0,258

Student's-t Test, *p<0,05

Total intraoperative fentanyl consumption was significantly lower in the preincisional infiltration group (p=0.042) (Table 3). The first analgesia requirement time was significantly longer in the preincisional infiltration group, as well (p=0.032). Higher opioid consumption was observed in the postincisional group in the postoperative period (p=0.019) (Table 3).

The number of patients who required analgesia in the postoperative period both within the first 4 hours and within the 4-12 hour range was significantly higher in the postincisonal infiltration group (p=0.036, p=0.049). None of the patients in either group required a second dose of opioid after the first injection. The total number of patients requiring analgesia was significantly lower in the preincisional infiltration group (n=4 [13.3%], n=9 [30%] for Groups 1 and 2, respectively; p=0.027) (Table 3). No complications or side effects due to local anesthetic infiltration in either group were observed during the 24-hour follow up. Patient satisfaction was significantly higher in Group 1, the preincisional local anesthetic infiltration group, based on median satisfaction scores based on a 10-point scale (Table 4).

Table 3. Comparison of first analgesic requirement time, opioid consumption and number of patients who needed analgesia; expressed as mean±SD, n (%)

	Group 1 Preincisional n:30	Group 2 Intraincisional n:30	P value
Perioperative fentanyl consumption(mcg)	154,4±12,1	174,8±14,2	0,042*
[a]First analgesic requirement time (min)	159.4 ± 78,6	118.6 ± 56,4	0,032*
[a]Postoperative tramadol consumption (mg)	72,4 ± 24,5	91,5 ± 36,8	0,019*
Number of patients who needed analgesia in the 0-4 hours (n)	3 (%10)	6 (%20)	0,036*
Number of patients who needed analgesia in 4-12 hours (n)	1 (%3,3)	3 (%9,9)	0,049*
Number of patients who needed analgesia in 12-24 hours (n)	0	0	0,938
Total number of patients who needed analgesia (n)	4 (%13,3)	9 (%30)	0,027*

Fisher's exact test, [a]Student's-t Test, *p<0,05

Tablo 4. Comparison of patient satisfaction; expressed as median(min-max).

	Group 1 Preincisional n:30	Group 2 Intraincisional n:30	P value
Patient satisfaction (0-10)	9(7-10)	8(6-9)	0,032*

Mann-Whitney U test , *p<0,05

Discussion

Postoperative pain following thyroid surgery is a somatic type that substantially originates from the skin incision [8]. Hence, local anesthetic infiltration theoretically could largely solve the problem. The most striking advantage of local anesthetic infiltration for postoperative pain management is that it is a fast and safe method [6]. Indeed, thyroid surgery can totally be executed under local anesthesia [11]. Many studies have evaluated the effects of various agents, such as lidocaine, ropivacine, and bupivacaine in different types of surgery. One of these studies compared preincisional levobupivacaine and ropivacaine in laparoscopic cholecystectomy procedures and reported that levobupivacaine was superior for postoperative pain management [12].

Local anesthetics act by stabilizing the neuronal membrane and preventing depolarization of the membrane. Levobupivacaine maintains this effect for 5-16 hours, so its use is favoured for long-term postoperative analgesia. High potency, good tissue penetration, and analgesia effect without motor block at a low concentration are additional reasons for preferring this agent [9].

Superficial cervical plexus block is another option for pain management after thyroid surgery [5]. Dostbil et al. studied superfi-

cial cervical plexus block in thyroid surgery and concluded that it was superior to wound infiltration with local anesthetic in terms of analgesia [13]. However, the block is a more invasive method and has a difficult application technique [6]. Effective pain relief and reduced analgesic consumption were obtained after thyroid and parathyroid surgery in a study that prepared for wound infiltration with 0.5% bupivacaine [10]. Based on this information, in the present study we preferred the local anesthetic infiltration method and levobupivacaine for postoperative pain management.

In almost all of the studies that have investigated the effects of wound infiltration or intraperitoneal application of local anesthetics, more successful postoperative pain management and less analgesic consumption have been observed [6,8]. On the other hand, in a newly-reported double-blind placebo-controlled study, the authors concluded that surgical site analgesia at the end of thyroid surgery is not associated with any significant analgesic benefit [14]. However, ropivacaine was the preferred agent for that study and all of the patients received local anesthetic at the end of surgery, unlike our study, which also investigated preincisional anesthetic infiltration. Both preincisional and postincisional levobupivacaine infiltration provided good analgesia in our study; however, preincisional application was more advantageous in this regard. It is reported that by preventing nociceptive stimulations from reaching the central nervous system, preincisional application of local anesthetic represses hyperexitation which is responsible for severe postoperative pain [15]. This explains the superiority of preincisional levobupivacaine application over postincisional infiltration in this trial. Bagul et al. also studied preincisional infiltration of local anesthetic following thyroid surgery and reported superior postoperative pain management in the study group compared to a no infiltration group, with no effect on bruising or wound cosmesis [16].

This study was undertaken because of the lack of infiltration anesthesia studies in neck surgeries. We aimed to compare the effects of levobupivacaine infiltration anesthesia administered at different times. Lower VAS scores in the early postoperative period, less analgesic consumption in both the intraoperative and postoperative periods, postponement of first analgesic requirement, and higher patient satisfaction were obtained in the preincisional infiltration group. However, while the difference in VAS scores and analgesic consumption of the two groups were statistically significant, they are not very different numerically. Hence, it is questionable whether these results are clinically significant. Additional studies with more patients are needed clarify this point. In addition to these results, no side effects due to the application or to the drug itself were observed in either the preincisional or postincisional wound infiltration groups.

As the result, local anesthetic infiltration is a safe, practical method of pain management following thyroid surgery. Levobupivacaine is a proper agent for this purpose because of its safe use and prolonged action time. Infiltrating levobupivacaine before performing the incision provides even better results. There is a need for studies with a larger number of subjects and control groups.

Competing interests

The authors declare that they have no competing interests.

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